GREEN VALLEY LAKE

Vigo County

2003-2004 Shad Selective and Follow-up Survey

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EXECUTIVE SUMMARY

- A shad selective was conducted on Green Valley Lake on October 22, 2003 in an effort to maintain the current game fish populations.

- A follow-up survey was conducted on June 7, 2004. Water chemistry and aquatic vegetation data were also collected.

- The secchi disk was 1.5 f with a heavy planktonic algae bloom. Dissolved oxygen was adequate for fish survival to a depth of 6 f. Submersed aquatic vegetation was found to a maximum depth of 8.5 ft. Coontail and Eurasian watermilfoil dominated the littoral sites followed by filamentous algae and curly-leaf pondweed. American pondweed and small pondweed were also found in the lake.

- A total of 358 fish representing eight species was collected during this survey. Gizzard shad were most abundant by number, followed by bluegill and largemouth bass.

- Bluegill growth decreased since the introduction of shad but remains at or above district averages for age 4 and above. Bluegill 6 inches or larger made up 30% of the catch. Largemouth bass growth was consistent with the district average up to age 5. Bass greater than 14 inches accounted for 19% of the bass sampled.

- The 2003 shad selective reduced the overall shad numbers. However, the 2004 catch rates indicated that the reduction of shad was short lived.

- The Division of Fish and Wildlife should monitor Green Valley Lake for shifts in game fish populations, control aquatic vegetation as necessary, and continue to stock channel catfish biennially on odd numbered years at 25 channel catfish/acre.

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INTRODUCTION

Green Valley Lake is located on the Green Valley State Fishing Area northwest of Terre Haute in Vigo County. It was originally constructed as a water supply reservoir for a coal mining operation. At the time the lake was constructed, the surface area was 40 acres. The Department of Natural Resources, Division of Fish and Wildlife purchased the property in the mid 1960's. A concrete boat ramp provides access and good shoreline fishing opportunities also exist. A 14-in minimum size limit on largemouth bass has been in effect since 1973.

Historically, Green Valley Lake had periodic problems with acid runoff from an abandoned coal mine on the southwest side of the lake. In 1994, a project was completed to seal off this area. Part of this project involved removing fill from the Green Valley property, which created a new 13-acre lake basin. This new basin has a maximum depth of approximately 20 ft with an average depth of 9 ft.

Since the new basin has a very limited watershed, it was connected to Green Valley Lake by a 43-ft wide boatable channel. This makes the two lakes a single unit as far as fish management activities are concerned. Prior to the construction project, Green Valley Lake had a relatively stable fish population with a history of good fishing. In the fall of 1994, 2,600 largemouth bass fingerlings were stocked in the new lake basin to strengthen the predator population. In 1999, gizzard shad, representing four year classes, were collected for the first time during a standard fisheries survey. Shad were the most abundant species at 42% of the fish collected. Gizzard shad can drastically alter the phytoplankton community and subsequently affect game fish populations. However, follow up surveys indicated that gizzard shad had not significantly impacted the fishery at Green Valley Lake. Based on data collected, it appears that shad reproduction is inconsistent. A shad selective was scheduled in an attempt to maintain the current game fish population.

This report presents results of the 2003 bathymetric survey, 2003 shad selective, 2004 standard fish survey, 2004 aquatic vegetation survey and recommendations for future work.

METHODS

A detailed contour map of the reservoir was generated by running transects across Green Valley Lake via boat at normal pool. A depth sounder, GPS unit, depth pole and hip chain were

employed. The surface area of each 2-ft stratum was measured with a planimeter and calculated as described in McMahon, Zale, and Orth. (1996).

$$Vs = h/3 (A1 + A2 + \sqrt{A1A2})$$

The sum of each 2-ft stratum in the 33.0-acre main lake was 132 acre-ft of water. The 13.9-acre pit volume was calculated at 172 acre-ft of water.

The shad selective was conducted on October 22, 2003 at both basins of Green Valley Lake. Rotenone, a piscicide, was applied using two boats with bailer set-ups. Target rotenone concentration was 0.1 parts per million (ppm). A total of 4.3 gallons was applied to the 13.9-acre pit and a total of 6.8 gallons was applied to the 33.0-acre main lake area.

A standard fish survey was conducted at Green Valley Lake on June 7, 2004. Survey effort included 0.75 h of night DC electrofishing, two overnight gill net lifts and two overnight trap net lifts. Fish were measured to the nearest 0.1 inch and scales were taken for age and growth analysis. District 6 averages were used to calculate fish weights. Fish data was analyzed according to Anderson and Neumann, 1996. Water chemistry parameters were measured according to standard lake survey guidelines.

Aquatic vegetation was surveyed on July 14, 2004 according to Pearson, 2003.

RESULTS

In the 2003 shad selective, the resulting rotenone concentration in the 13.9-acre basin was 0.08 ppm. Based on visual observations, this concentration produced good results. Rotenone concentration of the 33.0-acre main lake area was 0.15 ppm. This application appeared inadequate at the time of the application. More rotenone was not applied because the recommended maximum of 0.13 ppm had been exceeded.

In 2004, water chemistry was normal for an impoundment in central Indiana. The green water color and the 1.5-ft secchi disk reading indicated a heavy planktonic algae bloom. Dissolved oxygen was adequate for fish survival to a depth of 6 ft.

Plants found during the vegetation survey included coontail, Eurasian watermilfoil, filamentous algae, and three species of pondweed (American, curly-leaf and small). Coontail and Eurasian watermilfoil were the most abundant types of plants at the time of the survey, occurring in 97% and 77% of the sample sites, respectively.

During the 2004 standard fish survey, a total of 358 fish representing eight species was collected. Gizzard shad dominated the catch by number (32%) followed by bluegill (29%), largemouth bass (24%), warmouth (9%), channel catfish (5%) and black crappie (1%). Black bullhead and redear each represented less than one percent. Also observed during the survey were blackstriped topminnow and western mosquitofish.

The 115 gizzard shad ranged from 11.6 to 14.5 in. The electrofishing catch rate (119 shad/h) was comparable to pre-selective survey (110 shad/h) in 2002 (Schoenung 2002). The gill net catch was 13.0 shad/lift in 2004 compared to 44.8 shad/lift in 2002.

The bluegill sample consisted of 103 fish ranging from 1.4 to 9.6 in (PSD = 49). The electrofishing catch rate was 95 bluegill/h. Bluegill of harvestable size (6.0 in or larger) accounted for 30% of bluegill collected. The RSD8 was 31. Bluegill growth prior to introduction of gizzard shad was at or better than the district average (Table 1). Since the introduction of shad, bluegill growth had decreased for ages 1 through 4 but remained at or above district averages for ages 4 and above (Andrews 1995, Sapp 1999, Schoenung 2002). The 2004 survey documented the first increase in growth of age-1, 2 and 4 bluegill since the arrival of shad. This is likely due to the overall reduction in shad from the 2003 selective.

A total of 86 largemouth bass was collected ranging in length from 1.3 to 16.9 in (PSD = 69). Largemouth bass of legal size (14 in or larger) accounted for 19% of the bass (RSD14 = 22). The largemouth bass electrofishing catch rate of 111 fish/h was down from the 2002 catch rate of 179 fish/h (Schoenung 2002). Bass growth has remained consistent with average growth up to age 5 (Table 2).

Other fish collected in the survey included 32 warmouth ranging in length from 2.3 to 8.5 in, 16 channel catfish (6.9 to 24.8 in), 4 black crappie (4.6 to 10.5 in), 1 black bullhead (13.0 in), and 1 redear (8.6 in).

DISCUSSION

When gizzard shad were first collected in the 1999 survey, four year classes (ages 1, 3, 4 and 5) were present. Predominantly ages 3 and 4 were colleted. Shad were collected at a rate of 41 shad/h. After ten years, shad catch rates have remained strikingly low (119 shad/h). In comparison, catch rates at other area shad lakes were 508 shad/h at Sullivan Lake in 2001 and 929 shad/h at West Boggs Creek Reservoir in 2003 (Schoenung 2002 and 2004). The length

frequency distributions from past surveys indicate highly variable shad reproduction (Figure 1). Winter kills may play a role, as could predation from largemouth bass or channel catfish.

The impact gizzard shad have had on the sport fishery is not readily evident. The 2003 shad selective reduced the overall shad numbers based on visual observations made at the time of treatment. However, shad catch rates in 2004 (119 shad/h) and length frequency distribution indicated the selective conducted in 2003 was unsuccessful. Any immediate benefits from the selective were likely obscured by the efficient manner in which shad reproduce.

Post-selective gains in bluegill growth are noteworthy. However, bluegill were reaching above average size by age 4 prior to the selective. Length frequency distributions of bluegill over time do not indicate a reduction in year class strength in the presence of shad (Figure 2). Year class strength of largemouth bass since the introduction of shad (Figure 3) does not appear to have declined. There is sufficient largemouth bass recruitment to maintain the bass population. The limiting factor for largemouth bass is fishing pressure. The minimal overall impact gizzard shad have had on the game fish population does not warrant an additional shad selective at this time. Benefits would be short term and unsustainable. Green Valley Lake should continue to be monitored for any negative shifts in game fish size structure or growth.

Overall, aquatic vegetation appeared to be adequate for fish habitat with an 8.5-ft littoral depth. Herbicide applications for the control of nuisance aquatic vegetation are made on an annual basis. The goal is to increase shoreline fishing opportunities while maintaining a healthy level of vegetation. Herbicide applications should continue as needed to achieve these goals and maintain access.

The channel catfish population at Green Valley Lake is supplemented with biennial stockings. Stocking rates increased from 17 to 25 catfish/acre in 2003 because of the apparent high pressure. This stocking rate should continue with the next stocking scheduled in 2005.

RECOMMENDATIONS

- The Division of Fish and Wildlife should continue to monitor Green Valley Lake for shifts in the game fish populations.
- Submersed aquatic vegetation should continue to be controlled as necessary to achieve management goals and maintain access.

- The Division of Fish and Wildlife should continue to stocking channel catfish biennially on odd numbered years at 25 channel catfish/acre.

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Table 1. Bluegill average back calculated length (inches) at age for Green Valley Lake in 1995, 1999, 2002 and 2004 compared to the District 6 bluegill growth average.

Sample Year	1	2	3	4	5	6	7
1995	1.8	3.4	5.9	7.6	8.3		
1999	1.6	2.8	5	6.3	7.6	8.1	
2002	1.3	2.6	4.6	7.1	8.1		
2004	1.7	2.9	4.1	7.3	7.8	8.3	9.4
District 6 Average	1.6	3.3	5.3	6.8	7.5	7.7	

Table 2. Largemouth bass average back calculated length (inches) at age for Green Valley Lake in 1995, 1999, 2002 and 2004 compared to the District 6 largemouth bass growth average.

Sample Year	1	2	3	4	5	6	7
1995	4.2	8.9	10.7	13.7	16.7	18.5	
1999	4.8	9.0	11.2	13.2	14.7		
2002	4.7	8.6	11.3	13.4	14.2	15.0	
2004	4.3	8.8	11.8	13.4	14.0	13.7	
District 6 Average	4.7	8.9	11.8	13.6	15.5	17.1	

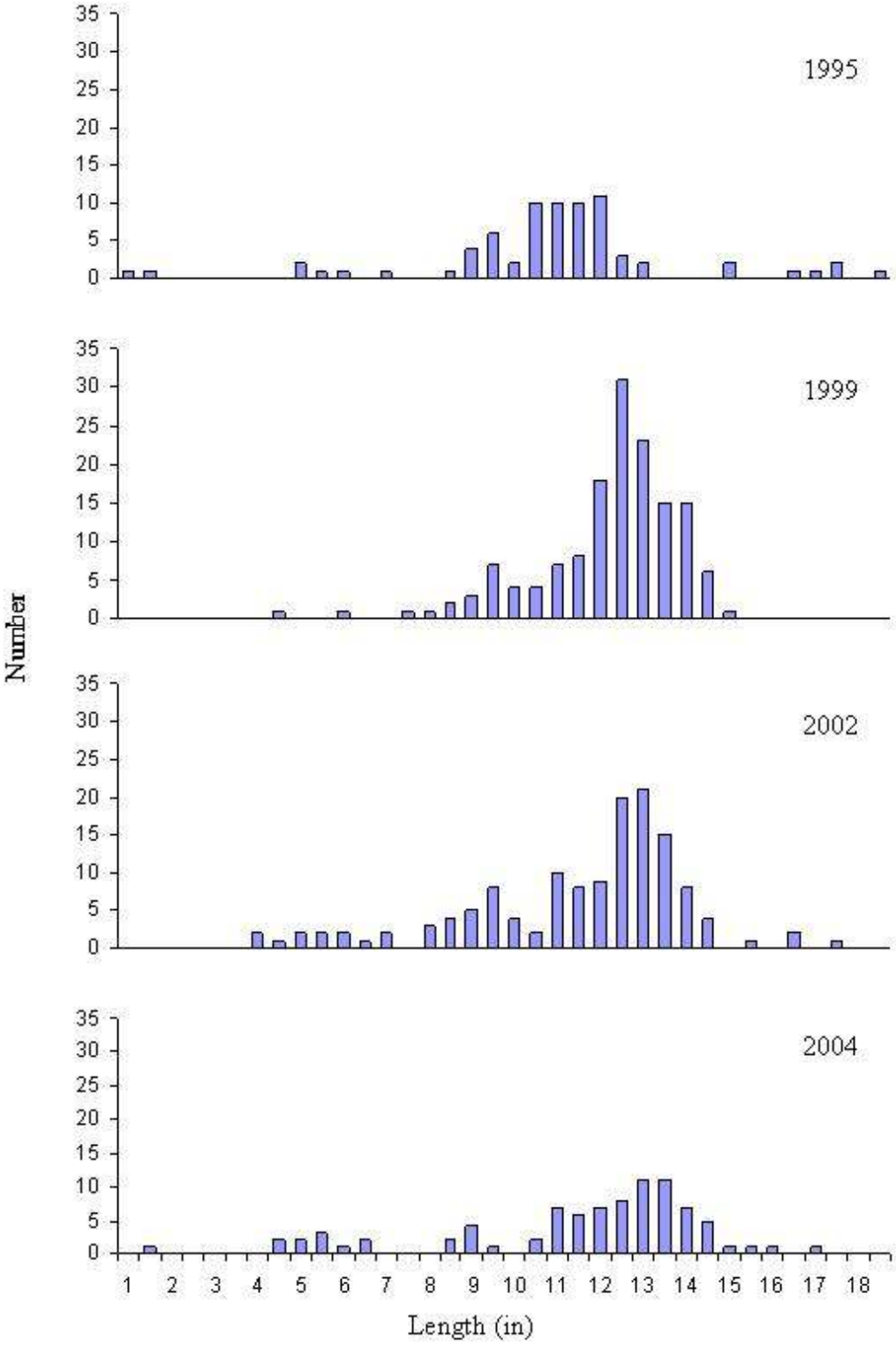

Figure 3. Total number of largemouth bass by length (inches) collected at Green Valley Lake in 1995, 1999, 2002 and 2004.

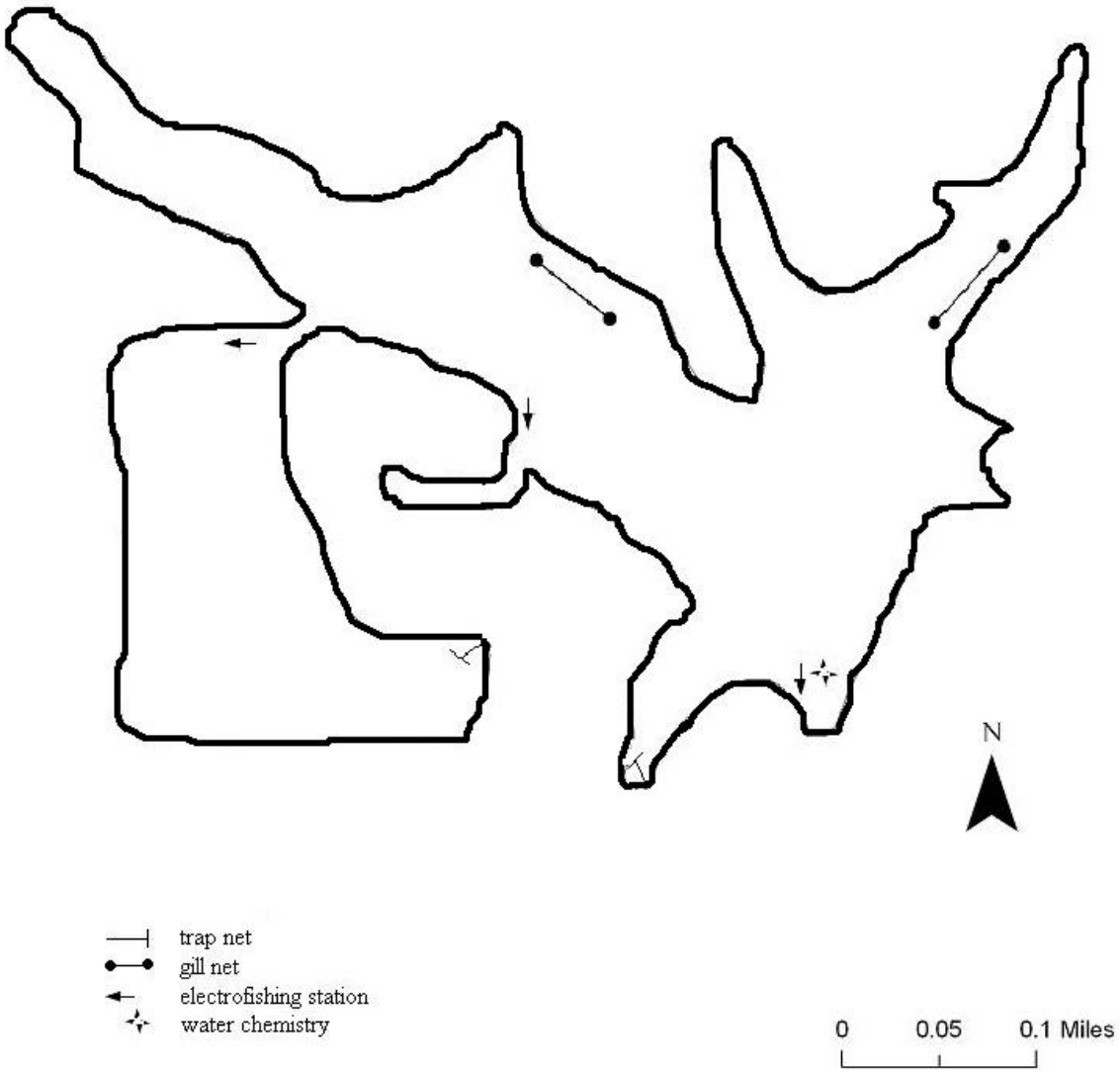

Figure 4. Green Valley Lake, Vigo County. Location of water chemistry, gill nets, trap nets and electrofishing stations in 2004.